Finding LCM and GCF – The Korean Way

Don't you wish there was an easier way to compute common multiples and greatest factors? There is! A parent showed me the Korean way. It gives you both LCM and GCF at the same time.

Find the GCF and LCM of 6 and 18.

1. Write 6 and 18 side by side.
   Leave some room around it for long division.

   $$\overline{)\ 6,\ 18}$$

2. Think of *any* common factor.
   Let's use 2.

   $$\begin{array}{r} 3,\ \ 9 \\ \hline 2)\overline{6,\ 18} \end{array}$$

3. Divide 6 and 18 by the common factor.
   Write the result above, as in regular division.

4. Look at the results, and find another common factor.
   Let's use 3, and continue the long division of both numbers.

   $$\begin{array}{r} 1,\ \ 3 \\ \hline 3)\overline{3,\ 9} \\ \hline 2)\overline{6,\ 18} \end{array}$$

5. If you can think of 6 right away, that's great.
   But you can start with any common factor and get the same result.

6. Now all the common factors are listed on the left. ———
   Together these make the GCF!
   GCF = 2 × 3 = 6

   $$\begin{array}{r} 1,\ \ 3 \\ \hline 3)\overline{3,\ 9} \\ \hline 2)\overline{6,\ 18} \end{array}$$

7. The remaining factors (which are *not* common) are listed across the top. ———
   Take *all* the factors together to make the LCM!
   LCM = 2 × 3 × 1 × 3 = 18

   $$\begin{array}{r} 1,\ \ 3 \\ \hline 3)\overline{3,\ 9} \\ \hline 2)\overline{6,\ 18} \end{array}$$

Example: Find the GCF and LCM of 16 and 18.

GCF = 2
LCM = 2 × 8 × 9 = 144

$$\begin{array}{r} 8,\ \ 9 \\ \hline 2)\overline{16,\ 18} \end{array}$$

Example: Find the GCF and LCM of 9 and 18.

GCF = 3 × 3 = 9
LCM = 3 × 3 × 1 × 2 = 18

$$\begin{array}{r} 1,\ \ 2 \\ \hline 3)\overline{3,\ 6} \\ \hline 3)\overline{9,\ 18} \end{array}$$

Using the Korean Way with Three Numbers

The Korean method of solving LCM and GCF can be extended to three numbers. However, the process is a little more complicated because you need to keep track of which factors are common to all three numbers, and which factors only apply to two factors.

Example: Find the GCF and LCM of 6 and 9 and 12.

1. Write the three numbers side by side.
   Leave room for doing long division.

$$\overline{)\ 6,\ \ 9,\ \ 12}$$

2. Think of *any* common factor.
   Let's start with 3.
   Write the results above, as in regular division.

$$\frac{2,\ \ 3,\ \ 4}{3\overline{)\ 6,\ \ 9,\ \ 12}}$$

3. Look at the results, and find another common factor.
   Notice that 2 is a common factor for only two numbers.

4. Divide through by 2, but only on two numbers.
   Copy the remaining number (3) so we don't forget it.

$$\begin{array}{r} 1,\ \ 3,\ \ 2 \\ \hline 2\overline{)\ 2,\ \ 3,\ \ 4} \\ \hline 3\overline{)\ 6,\ \ 9,\ \ 12} \end{array}$$

5. Now the common factors are listed on the left.
   But *don't* include the 2 because it is not common to all three numbers!
   (Now you see where you need to keep track of commonality.)
   GCF = 3

6. The LCM is composed of all the factors on the left *and* all the factors along the top. This is the same as with just working on two numbers.
   Take *all* the factors together to make the LCM!
   LCM = $3 \times 2 \times 1 \times 3 \times 2 = 36$

$$\begin{array}{r} 1,\ \ 3,\ \ 2 \\ \hline 2\overline{)\ 2,\ \ 3,\ \ 4} \\ \hline 3\overline{)\ 6,\ \ 9,\ \ 12} \end{array}$$

Example: Find the GCF and LCM of 3, 6, 9.

GCF = 3
LCM = $3 \times 1 \times 2 \times 3 = 36$

$$\frac{1,\ \ 2,\ \ 3}{3\overline{)3,\ \ 6,\ \ 9}}$$

Example: Find the GCF and LCM of 10, 15, 20.

Note that 5 is common to all three numbers.
But 2 cannot divide into 3. So we copy 3 onto the top row so we don't overlook it.

$$\begin{array}{r} 1,\ \ 3,\ \ 2 \\ \hline 2\overline{)\ 2,\ \ 3,\ \ 4} \\ \hline 5\overline{)10,\ \ 15,\ \ 20} \end{array}$$

GCF = 5
LCM = $5 \times 2 \times 1 \times 3 \times 2 = 60$